

Correction to the specification

On page 7, the first paragraph of the section entitled "Detailed description of the invention" beginning on line 11 (paragraph 0016 of the published application) should be corrected in order to reflect the issuance of the application cited, on line 17.

[0016] Molecules in solution are generally characterized by their weight averaged molar mass M_w , their mean square radius $\langle r_g^2 \rangle$, and the second virial coefficient A_2 . The latter is a measure of the interaction between the molecules and the solvent. For unfractionated solutions, these properties may be determined by measuring the manner by which they scatter light using the method described by Bruno Zimm in his seminal 1948 paper that appeared in the Journal of Chemical Physics, volume 16, pages 1093 through 1099. More recently, the method discussed in ~~co-pending Application 10/205,637~~ U.S. Patent Number 6,651,009 by Trainoff and Wyatt ~~filed 24 July 2002, in process of issuance,~~ represents an advanced technique that will replace the more traditional Zimm approach.

Typographical corrections to the specification

In two locations the subscript n should be replaced with the subscript l in paragraph 0043 of the published application.

[0043] Consider a simple linear model for interdetector broadening. For the purposes of discussion, assume that the concentration detector is located downstream of the MALS detector. Furthermore, assume that Eq. (3) is satisfied, and that data for a monodisperse reference sample has been collected. Therefore, the measured concentration depends on the underlying concentration in the MALS detector via the convolution with a parameterized broadening function $B(\alpha_0, \alpha_1, \dots, \alpha_l, \tau)$. One has

$$c^m(t) = \int_{-\infty}^{\infty} c(t-\tau) B(\alpha_0, \alpha_1, \dots, \alpha_l, \tau) d\tau \quad c^m(t) = \int_{-\infty}^{\infty} c(t-\tau) B(\alpha_0, \alpha_1, \dots, \alpha_l, \tau) d\tau, \quad (10)$$

In two locations the subscript n should be replaced with the subscript l in paragraph 0044 of the published application.

[0044] where $c^m(t)$ is the measured concentration at the downstream detector following broadening, and $c(t)$ is the concentration of the sample when it passed through the light scattering detector. The parameters $[\alpha_n]$ α_i are model specific and include the width of the broadening function and the interdetector delay volume. The goal of the broadening correction is to find the best-fit values of these parameters. According to Eq. (5) one may write

$$c^m(t) = \frac{1}{K^*M} \int_{-\infty}^{\infty} R(0, t-\tau) B(\alpha_0, \alpha_1, \dots, \alpha_n, \tau) d\tau$$

$$\underline{c^m(t) = \frac{1}{K^*M} \int_{-\infty}^{\infty} R(0, t-\tau) B(\alpha_0, \alpha_1, \dots, \alpha_i, \tau) d\tau} \quad (11)$$

In two locations in equation 12 the subscript n should be replaced with the subscript l in paragraph 0046 of the published application as follows:

[0046] Here we have used the fact that the peak is monodisperse, so that the molar mass M does not change across the peak, and it can be brought outside the integral. In order to determine the best fit parameters, one forms the chi-squared difference between the downstream measured concentration signal, $c^m(t)$, and the broadened upstream light scattering signal and integrates it across the monodisperse sample peak

$$\chi(\alpha_0, \dots, \alpha_n, \tau)^2 = \int_{peak} \left(c^m(t) - \frac{1}{K^* M} \int_{-\infty}^{\infty} R(0, t - \tau) B(\alpha_0, \dots, \alpha_n, \tau) d\tau \right)^2 dt.$$

$$\chi(\alpha_0, \dots, \alpha_l, \tau)^2 = \int_{peak} \left(c^m(t) - \frac{1}{K^* M} \int_{-\infty}^{\infty} R(0, t - \tau) B(\alpha_0, \dots, \alpha_l, \tau) d\tau \right)^2 dt \quad (12)$$

In one location the subscript n should be replaced with the subscript l in paragraph 0048 of the published application as follows:

[0048] As a practical matter, one may include other system specific parameters in the above fit. For example, the excess Rayleigh ratio in Eq. (12) is defined as the difference between Rayleigh ratio of the solvent with sample, and the Rayleigh ratio of the pure solvent. The Rayleigh ratio of the pure solvent can be included as an adjustable fit parameter, instead of manually determining it by setting a solvent baseline. Similarly, if the concentration detector has a slow drift, then the offset and slope of the drift can similarly be included in the fit. It is important to note that it is essential that the molar mass is constant over the peak so that the inner integral in Eq. (12)

$$\int_{-\infty}^{\infty} R(0, t - \tau) B(\alpha_0, \dots, \alpha_n, \tau) d\tau$$

$$\int_{-\infty}^{\infty} R(0, t - \tau) B(\alpha_0, \dots, \alpha_l, \tau) d\tau$$

In one location the subscript n should be replaced with the subscript l in paragraph 0051 of the published application as follows:

[0051] Consider the traditional deconvolution method. One may reconstruct $c(t)$ from knowledge of $c^m(t)$ by writing the Fourier Transform

$$c(t) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{-i\omega t} \frac{\tilde{c}^m(\omega)}{\tilde{B}(\alpha'_1, \dots, \alpha'_n, \omega)} d\omega,$$

$$c(t) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{i\omega t} \frac{\tilde{c}^m(\omega)}{\tilde{B}(\alpha'_1, \dots, \alpha'_n, \omega)} d\omega, \quad (13)$$

where

$$\tilde{c}^m(\omega) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{\infty} e^{i\omega t} c^m(t) dt, \quad (14)$$

In three locations the subscript n should be replaced with the subscript l in paragraph 0052 of the published application as follows:

[0052] is the Fourier transform of the measured concentration, and $\tilde{B}(\alpha'_1, \dots, \alpha'_n, \omega)$

$\tilde{B}(\alpha'_1, \dots, \alpha'_n, \omega)$ is similarly the Fourier transform of the broadening kernel evaluated with the fit parameters found above. One may then compute the molar mass as a function of time by using Eq. (5). The problem with this procedure lies in computing the ratio

$$\tilde{c}^m(\omega) / \tilde{B}(\alpha'_1, \dots, \alpha'_n, \omega) \quad \tilde{B}(\alpha'_1, \dots, \alpha'_n, \omega)$$

Both $\tilde{c}^m(\omega)$ and $\tilde{B}(\alpha'_1, \dots, \alpha'_n, \omega)$

$\tilde{B}(\alpha'_1, \dots, \alpha'_n, \omega)$ end towards zero as $\omega \rightarrow \pm\infty$. Therefore, the ratio tends towards 0/0 which

is indeterminate. Because $\tilde{c}(\omega)$ contains experimental noise, the ratio will have increasing large fluctuations for large ω . Therefore, when one computes $c(t)$ using Eq. (13), the result contains high frequency noise and unphysical “ringing,” including negative concentrations. While the noise can be filtered out, the unphysical ringing cannot.

In one location the subscript n should be replaced with the subscript l in paragraph 0053 of the published application as follows:

[0053] The second method, which is the subject of this patent, is to broaden the light scattering peak. Therefore, we write

$$M(t) = \frac{1}{K^* c^m(t)} \lim_{\theta \rightarrow 0} \int_{-\infty}^{\infty} R(\theta, t - \tau) B(\alpha'_1, \dots, \alpha'_n, \tau) d\tau$$

$$M(t) = \frac{1}{K^* c^m(t)} \lim_{\theta \rightarrow 0} \int_{-\infty}^{\infty} R(\theta, t - \tau) B(\alpha'_1, \dots, \alpha'_l, \tau) d\tau \quad (15)$$
